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(54) Title: ABSORBENT STRUCTURE, AND ABSORBENT ARTICLE CONTAINING THE ABSORBENT STRUCTURE

(57) Abstract: The invention relates to an absorbent structure (3) for an absorbent article such as a diaper (100), an incontinence pad, a sanitary towel or the like, the absorbent structure (3) having, in the longitudinal direction, a central portion (11) and two end portions (12, 13). The invention is characterized mainly in that the average density of the material in the central portion (11), at least in the dry state, is higher than the average density of the material in the end portions (12, 13) and in that the central portion (11), at least in the dry state, has a lower basis weight than the end portions (12, 13), the density and the basis weight being calculated on the basis of the entire surface area of the central portion (11) or as appropriate the entire surface area of the end portion (12, 13). The invention also relates to an absorbent article comprising such an absorbent structure (3).

TITLE

Absorbent structure, and absorbent article containing the absorbent structure.

TECHNICAL FIELD

The present invention relates to an absorbent structure for an absorbent article such as a diaper, an incontinence pad, a sanitary towel or the like, the absorbent structure having, in the longitudinal direction, a central portion and two end portions. The invention also relates to an absorbent article containing such an absorbent structure.

BACKGROUND ART

Absorbent structures for disposable absorbent articles such as diapers, incontinence pads and sanitary towels are in most cases constructed from one or more layers of hydrophilic fibres, for example cellulose fluff pulp. Also included in most cases are superabsorbents, which are polymers which are capable of absorbing liquid corresponding to many times their own weight. The absorbent structure can also comprise further component parts, for example for improving liquid-spreading or for increasing the cohesive capacity and the capacity for resisting deformation under loading.

A major problem, above all in the use of baby diapers and incontinence pads for adults, which have to be capable of receiving and absorbing large quantities of liquid in a relatively short time, is that these often leak before the total absorption capacity has been fully utilized. As a large quantity of liquid can be discharged in a few seconds, this can lead to the absorbent structure temporarily becoming locally saturated with liquid in what is known as the liquid-receiving zone. There is not enough time for the liquid to spread further

to other parts of the absorbent structure, which can in turn lead to liquid leaking out of the diaper.

From EP 0,254,476 and EP 0,325,416, an absorbent structure is known, which, in a zone essentially directly in front of the wetting area, has a lower basis weight and a lower density compared with surrounding portions of the absorbent structure. By virtue of such a structure, an area with an open structure and a great liquid take-up capacity is obtained. However, it can be difficult for the liquid to spread from the high-bulk open structure in the wetting area to the two end portions.

From EP 0,525,778, an absorbent structure is also known, which, in a zone essentially directly in front of the wetting area, has a higher basis weight and a lower density than in the end portions. One advantage of such a structure is that the wetting area has a high-bulk open structure which is capable of rapidly receiving a large quantity of liquid.

It has nevertheless been found that there is room for improvement with regard to the construction of an absorbent structure which is capable of rapidly receiving a large quantity of liquid at the same time as it is thin, flexible and discreet to wear.

DISCLOSURE OF INVENTION

By means of the present invention, an absorbent structure for an absorbent article of the type mentioned in the introduction has been produced, which structure is capable of rapidly receiving a large quantity of liquid at the same time as it is thin, flexible and discreet to wear.

An absorbent structure according to the invention is characterized mainly in that the average density of the material in the central portion, at least in the dry state, is higher than the average density of the material in the end

portions, and in that the central portion, at least in the dry state, has a lower basis weight than the end portions, the density and the basis weight being calculated on the basis of the entire surface area of the central portion or as appropriate the entire surface area of the end portions.

As the central portion constitutes the area of the article which receives the discharged liquid first, it is important that this area can rapidly receive a large quantity of liquid. Furthermore, the central portion is subjected to relatively greater mechanical stress than the end portions during use of the absorbent article. This means that it is especially important for a thin, soft and flexible material to be positioned in the central portion of the absorbent structure. An absorbent article comprising an absorbent structure according to the invention satisfies all these criteria. The central portion means that area in the absorbent structure which is located in what is known as the liquid-receiving zone, that is to say the zone which is expected to be wetted first by the discharged liquid when the absorbent structure is used in an absorbent article. The liquid-receiving zone is usually located between 10 cm and 20 cm from the front edge of the absorbent structure.

According to one embodiment, the absorbent structure comprises a liquid-storing layer and a liquid-receiving layer, the liquid-receiving layer being positioned at least in the central portion of the absorbent structure. The upper, liquid-receiving layer is preferably such that it expands rapidly in the thickness direction of the structure on wetting. One advantage of a liquid-receiving layer which expands in the thickness direction of the structure on wetting is that such a layer is thin before wetting and that it expands rapidly in the thickness direction on wetting. This means that such a structure becomes more open and voluminous and can receive a large quantity of liquid in a short time. It is also possible to have a liquid-receiving layer which has a very narrow central portion before wetting but which, on wetting, expands in the direction of its plane so that its width increases. On wetting, the liquid-receiving layer can therefore expand both in the thickness direction of the

structure and in the direction of its plane, or alternatively in only one of said directions.

An example of a material for the liquid-receiving layer is a superabsorbent foam. Such a superabsorbent foam preferably has a density in the dry state of from 0.2 g/cm^3 to 1.0 g/cm^3, and a basis weight in the dry state of from 200 g/m^2 to 800 g/m^2. One advantage of a superabsorbent foam is that it is a soft and flexible material. When a wearer moves, the article is subjected to the greatest mechanical stress in the crotch portion of the article, which means that it is especially advantageous for a soft and flexible material to be positioned in the central portion of the absorbent structure. Another advantage of a superabsorbent foam as liquid-receiving layer is that such a material is also capable of absorbing and storing liquid, which in turn reduces the risk of liquid leakage. The superabsorbent foam is preferably hard-compressed in the dry state, expanding in the thickness direction of the structure on wetting. It is also possible to have a superabsorbent foam which has a very narrow central portion before wetting but which, on wetting, expands in the direction of its plane so that its width increases. On wetting, the superabsorbent foam can therefore expand both in the thickness direction of the structure and in the direction of its plane, or alternatively in only one of said directions.

Another example of a suitable material for the liquid-receiving layer is a foam made of regenerated cellulose, what is known as a viscose foam. Such a viscose foam is preferably hard-compressed in the dry state, expanding in the thickness direction of the structure and/or in the direction of its plane on wetting. A further example of a material for the liquid-receiving layer is a dry-formed sheet containing 5-100% cellulose fibres, which has a density of from 0.2 g/cm^3 to 1.0 g/cm^3 and a basis weight of from 30 g/m^2 to 1200 g/m^2. Such a dry-formed sheet has been formed by compression of a web containing cellulose fibres without subsequent defibration and fluff-formation.

The liquid-storing layer is preferably a mixed structure made of cellulose fluff fibres and superabsorbent material. The mixed structure consisting of cellulose fluff fibres and superabsorbent material preferably has a density in the dry state of from 0.1 g/cm^3 to 0.7 g/cm^3 and a basis weight in the dry state of from 200 g/m^2 to 1500 g/m^2. The superabsorbent material can be in the form of, for example, particles, flakes or fibres. However, a liquid-storing layer consisting of only a superabsorbent material, for example a superabsorbent foam, is also conceivable.

According to another embodiment, the absorbent structure also comprises a liquid-spreading layer. The liquid-spreading layer consists of a thin layer which is positioned furthest away from the side which, when the absorbent structure is arranged in an absorbent article, is intended to face the wearer, and extends over the whole surface of the absorbent structure. The liquid-spreading layer consists of a material with a good liquid-spreading capacity, for example a thin layer of chemically produced cellulose fluff fibres. Chemically produced fluff pulps, which consist of fine fibres of essentially pure cellulose, generally have a good liquid-spreading capacity. In order to obtain a good liquid-spreading capacity, such a liquid-spreading layer consists of a structure with fine capillaries, and such a layer preferably has a high density. If appropriate, such a cellulose-based liquid-spreading layer also contains a small quantity of superabsorbent material in the form of, for example, particles. One advantage of a liquid-spreading layer is that such a layer is able to spread the liquid coming from the liquid-receiving layer in the central portion via the liquid-spreading layer out to the two end portions where the liquid can be taken up and stored in the liquid-storing layer. Another suitable material for the liquid-spreading layer is a thin layer of HIPE (high internal phase emulsion) foam. Such a foam is produced by polymerization of a water-in-oil emulsion. The solid phase of the foam creates a capillary system.

The invention also relates to an absorbent article such as a diaper, an incontinence pad, a sanitary towel or the like which has an essentially oblong shape, the article comprising a liquid-permeable surface layer, a liquid-impermeable backing layer, and, enclosed between these layers, an absorbent structure according to any one of the embodiments described.

BRIEF DESCRIPTION OF THE FIGURES

The invention will be described in greater detail below with reference to the illustrative embodiments shown in the accompanying drawings, in which

Figure 1 shows a diaper seen from the side which is intended to face the wearer during use;

Figure 2 shows the absorbent structure in the diaper according to Figure 1 from the side which is intended to face the wearer during use;

Figure 3 shows a section through the absorbent structure along the line III-III in Figure 2;

Figure 4 shows an alternative absorbent structure seen from the side which is intended to face the wearer, and

Figure 5 shows a section through the absorbent structure along the line V-V in Figure 4.

DETAILED DESCRIPTION OF THE FIGURES

The diaper 100 shown in Figure 1 comprises a liquid-permeable surface layer 1, for example made of non-woven fabric or perforated plastic film, a

liquidtight backing layer 2, for example made of plastic film or hydrophobic non-woven fabric, and an absorbent structure 3 enclosed between the two layers 1 and 2.

The diaper 100 is intended to surround the lower part of the abdomen of a wearer like a pair of absorbent pants. It has a rear portion 4 intended to face backwards on the wearer during use of the diaper, a front portion 5 intended to face forwards on the wearer during use, and, located between the rear portion 4 and the front portion 5, a narrower crotch portion 6 which is intended to be arranged in the crotch of the wearer between the legs of the latter. In order for it to be possible for the diaper to be fastened together to form the desired pants-shape, tape flaps 7 are arranged close to the rear waist edge 8 of the diaper. During use, the tape flaps 7 are attached to the outside of the front portion 5 of the diaper, close to the front waist edge 9, the diaper then being held together around the waist of the wearer. Other fastening means, such as touch-and-close tape, hooks or the like, are of course also possible.

The diaper 100 according to Figure 1 also comprises pretensioned elastic elements 10 which can consist of suitable material, such as elastic foam, elastic bands or thread-covered threads. For the sake of simplicity, these elements have been shown in the extended state in Figure 1. As soon as the stretching ceases, however, the elastic elements contract and in this way form elastic legbands of the diaper.

The diaper 100 also comprises an absorbent structure 3. The absorbent structure 3 has a central portion 11 positioned in the crotch portion 6 of the diaper and two end portions 12, 13 positioned in the front portion 5 and, respectively, the rear portion 4 of the diaper and is shown in detail and different alternative embodiments in Figures 2-5.

Alternatively, the liquid-permeable surface layer 1 can be a part of the absorbent structure 3. One advantage of such a construction is that, when the absorbent structure 3 comprises material which is hard-compressed in the dry state but which expands rapidly on wetting, the absorbent structure 3 can absorb freely without being hindered by the risk that the enclosed space between the liquidtight backing layer 2 and the liquid-permeable surface material 1 may be too small.

Figure 2 shows the absorbent structure 3 in the diaper 100 according to Figure 1 from the side which is intended to face the wearer during use. The absorbent structure 3 has a central portion 11, a first end portion 12 and a second end portion 13. The absorbent structure also has a front end edge 18 and a rear end edge 19. The central portion 11 means that area in the absorbent structure which is located in what is known as the liquid-receiving zone 14, that it to say the zone which is expected to be wetted first by the discharged liquid when the absorbent structure 3 is used in an absorbent article. The liquid-receiving zone is usually located between 10 cm and 20 cm from the front edge 18 of the absorbent structure 3.

The absorbent structure 3 is furthermore constructed from three different layers, a liquid-receiving layer 15, a liquid-storing layer 16 and a liquid-spreading layer 17. The liquid-receiving layer 15 is positioned in the central portion 11 of the absorbent structure and is intended to lie next to the liquid-permeable surface layer 1 when used in an absorbent article. The liquid-receiving layer 15 is made from, for example, a superabsorbent foam which is hard-compressed in the dry state but which expands rapidly in the thickness direction of the liquid-receiving layer 15 on contact with urine. The liquid-receiving layer 15 can also be a cellulose-based foam. An example of a cellulose-based foam is a compressed foam made of regenerated cellulose, what is known as a viscose foam. On wetting, such a compressed viscose foam expands very rapidly in the thickness direction of the material. It is also possible for the liquid-receiving layer to have a very narrow central portion

before wetting, but for the layer, on wetting, to expand in the direction of its plane so that its width increases. On wetting, the liquid-receiving layer 15 can therefore expand both in the thickness direction of the structure and in the direction of its plane, or alternatively in only one of said directions. Furthermore, the liquid-receiving layer 15 can be a dry-formed sheet containing 5-100% cellulose fibres, which has a density of from 0.2 to 1.0 g/cm^3 and a basis weight of from 30 to 1200 g/m^2, which sheet has been formed by compression of a web containing cellulose fibres without subsequent defibration and fluff-formation.

The liquid-storing layer 16 is positioned in the end portions 12, 13 of the absorbent structure 3. The liquid-storing layer 16 in the absorbent structure 3 in Figure 2 consists of two separate units, one liquid-storing unit being positioned in the first end portion 12 and the other liquid-storing unit being positioned in the second end portion 13. The liquid-storing layer 16 usually contains superabsorbent material, that is to say material which is capable of absorbing liquid corresponding to many times its own weight, and which material is also capable of retaining liquid under external loading. The liquid-storing layer is preferably a mixed structure made of cellulose fluff fibres and superabsorbent material. The mixed structure consisting of cellulose fluff fibres and superabsorbent material preferably has a density in the dry state of from 0.1 g/cm^3 to 0.7 g/cm^3 and a basis weight in the dry state of from 200 g/m^2 to 1500 g/m^2. The superabsorbent material can be in the form of, for example, particles, flakes or fibres. However, a liquid-storing layer consisting of only a superabsorbent material, for example a superabsorbent foam, is also conceivable.

The liquid-spreading layer 17 consists of a thin layer which is positioned furthest away from the side which is intended to face the wearer, and extends over the whole surface of the absorbent structure. The liquid-spreading layer 17 consists of a material with a good liquid-spreading capacity, for example a thin layer of chemically produced cellulose fluff fibres. Chemically produced

fluff pulps, which consist of fine fibres essentially pure cellulose, generally have a good liquid-spreading capacity. In order to obtain a good liquid-spreading capacity, such a liquid-spreading layer consists of a structure with fine capillaries, and such a layer preferably has a high density. If appropriate, a cellulose-based liquid-spreading layer also contains a small quantity of superabsorbent material in the form of, for example, particles. One advantage of a liquid-spreading layer 17 is that such a layer is able to spread the liquid coming from the liquid-receiving layer 15 in the central portion 11 via the liquid-spreading layer 17 out to the two end portions 12, 13 where the liquid can be taken up and stored in the liquid-storing layer 16. Another suitable material for the liquid-spreading layer 17 is a thin layer of HIPE (high internal phase emulsion) foam. Such a foam is produced by polymerization of a water-in-oil emulsion. The solid phase of the foam creates a capillary system.

Figure 3 shows a longitudinal section through the absorbent structure 3 along the line III-III in Figure 2. The absorbent structure therefore has a central portion 11, a first end portion 12 and a second end portion 13. As described in Figure 2, the absorbent structure 3 is constructed from three different layers, a liquid-receiving layer 15, a liquid-storing layer 16 and a liquid-spreading layer 17. Figure 3, which shows a section through the absorbent structure 3, shows that, in the dry state, the liquid-receiving layer 15 in the central portion 11 is thinner than the liquid-storing layer 16 in the two end portions 12, 13. By virtue of the liquid-receiving layer 15 being thinner than the liquid-storing layer 16, a lower basis weight is obtained for the material in the central portion 11 than for the material in the end portions 12, 13 in spite of that fact that the average density of the material in the central portion 11 is higher than the average density of the material in the end portions 12, 13. In this way, an absorbent structure 3 is obtained which, in an absorbent article, is discreet and comfortable to wear at the same time as it has good liquid-receiving, liquid-spreading and liquid-storing capacity.

Figure 4 shows an alternative embodiment of an absorbent structure 403 according to the invention seen from the side which is intended to face the wearer. The absorbent structure has a longitudinal direction V and a transverse direction VI.

The absorbent structure 403 also has a central portion 411, a first end portion 412 and a second end portion 413. Furthermore, the absorbent structure 403 is constructed from two different layers, a liquid-receiving layer 415 and a liquid-storing layer 416. The liquid-receiving layer 415 is positioned in the central portion 411 of the absorbent structure and is intended to be positioned next to the liquid-permeable surface layer when used in an absorbent article. The liquid-storing layer 416 extends over the whole surface of the absorbent structure 403. The liquid-storing layer 416 is intended to be positioned next to the liquidtight backing layer when the absorbent structure is used in an absorbent article. In the central portion 411 of the absorbent structure, the liquid-storing layer is slightly wider in the transverse direction VI of the absorbent structure than the liquid-receiving layer 415. In the central portion 411 of the absorbent structure, the liquid-receiving layer 415 is therefore positioned in what is known as the wetting zone, that is to say in the area which is expected to be wetted first by the discharged bodily fluid. The liquid-receiving layer 415 and the liquid-storing layer 416 can of course also have the same extent in the transverse direction VI, that is to say have the same width.

Figure 5 shows a longitudinal section through the absorbent structure along the line V-V in Figure 4, that is to say a section through the absorbent structure in its longitudinal direction. Figure 5 therefore shows the central portion 411 and the two end portions 412, 413. The two end portions 412, 413 therefore consist of only the liquid-storing layer 416, while the central portion 411 also comprises the liquid-receiving layer 415. It can be seen from Figure 5 that the thickness of the liquid-storing layer 416 is greater in the two end portions 412, 413 than in the central portion 411. As Figure 5 also

shows, the total thickness of the absorbent structure in the two end portions is greater than the total thickness of the absorbent structure in the central portion 411. By virtue of the absorbent structure 403 being thinner in the central portion 411 than in the two end portions 412, 413, a lower basis weight is obtained for the material in the central portion 411 than in the end portions 412, 413 in spite of that fact that the average density of the material in the central portion 411 is higher than the average density of the material in the end portions 412, 413. It is also possible for the absorbent structure shown in Figures 4 and 5 to comprise a thin liquid-spreading layer which is located against the liquid-storing layer 416 and is therefore positioned next to the liquidtight backing layer when the absorbent structure is used in an absorbent article.

The diaper 100 described in Figure 1 and the absorbent structures described in Figures 2-5 constitute only a few illustrative embodiments. Therefore, the shape of the diaper as also its design in other respects can be varied, and the shape of the absorbent structure as also its design in other respects can be varied.

CLAIMS

1. Absorbent structure (3) for an absorbent article such as a diaper (100), an incontinence pad, a sanitary towel or the like, the absorbent structure (3) having, in the longitudinal direction, a central portion (11) and two end portions (12, 13), characterized in that the average density of the material in the central portion (11), at least in the dry state, is higher than the average density of the material in the end portions (12, 13), and in that the central portion (11), at least in the dry state, has a lower basis weight than the end portions (12, 13), the density and the basis weight being calculated on the basis of the entire surface area of the central portion (11) or as appropriate the entire surface area of the end portions (12, 13).

2. Absorbent structure (3) according to Claim 1, characterized in that it comprises a liquid-storing layer (16) and a liquid-receiving layer (15), the liquid-receiving layer (15) being positioned at least in the central portion (11) of the absorbent structure.

3. Absorbent structure (3) according to Claim 2, characterized in that the liquid-receiving layer (15) is a superabsorbent foam, the superabsorbent foam having a density in the dry state of from 0.2 g/cm^3 to 1.0 g/cm^3, and a basis weight in the dry state of from 200 g/m^2 to 800 g/m^2.

4. Absorbent structure (3) according to Claim 2, characterized in that the liquid-receiving layer (15) is a foam made of regenerated cellulose.

5. Absorbent structure (3) according to Claim 2, characterized in that the liquid-receiving layer (15) is a dry-formed sheet containing 5-100% cellulose fibres, which has a density of from 0.2 g/cm^3 to 1.0 g/cm^3 and a basis weight of from 30 g/m^2 to 1200 g/m^2, which sheet has been formed by compression of a web containing cellulose fibres without subsequent defibration and fluff-formation.

6. Absorbent structure (3) according to any one of Claims 2-5, characterized in that the liquid-receiving layer (15) expands in the thickness direction of the absorbent structure (3) on wetting.

7. Absorbent structure (3) according to any one of Claims 2-6, characterized in that the liquid-storing layer (16) is a mixed structure made of cellulose fluff fibres and superabsorbent material.

8. Absorbent structure (3) according to Claim 7, characterized in that the liquid-storing layer (16) has a density in the dry state of from 0.1 g/cm^3 to 0.7 g/cm^3 and a basis weight in the dry state of from 200 g/m^2 to 1500 g/m^2.

9. Absorbent structure (3) according to any one of the preceding claims, characterized in that it comprises a liquid-spreading layer (17).

10. Absorbent article, such as a diaper (100), an incontinence pad, a sanitary towel or the like, which has an essentially oblong shape and comprises a liquid-permeable surface layer (1), a liquidtight backing layer (2), and, enclosed between these layers, an absorbent structure (3), which absorbent structure (3) has, in the longitudinal direction, a central portion (11) and two end portions (12, 13), characterized in that the average density of the material in the central portion (11), at least in the dry state, is higher than the average density of the material in the end portions (12, 13), and in that the central portion (11), at least in the dry state, has a lower basis weight than the end portions (12, 13), the basis weight and the density being calculated on the basis of the entire surface area of the central portion (11) or as appropriate the entire surface area of the end portions (12, 13).

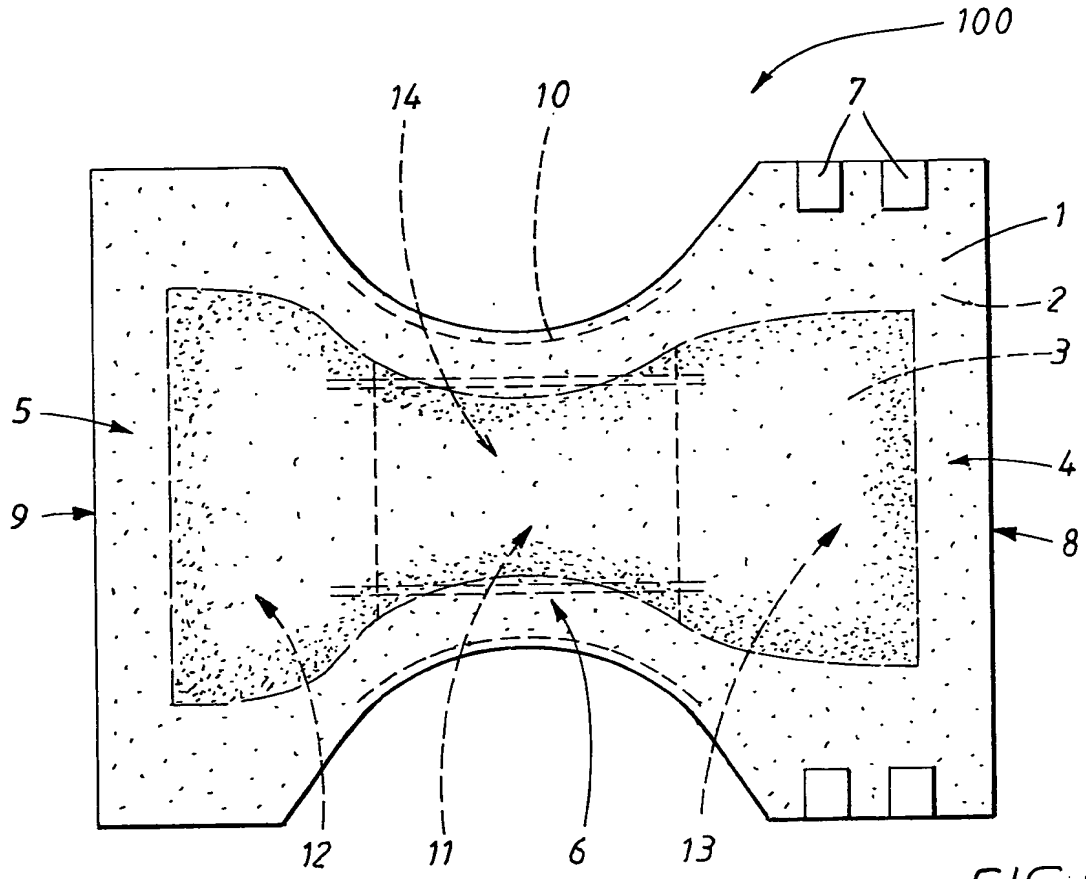

FIG.1

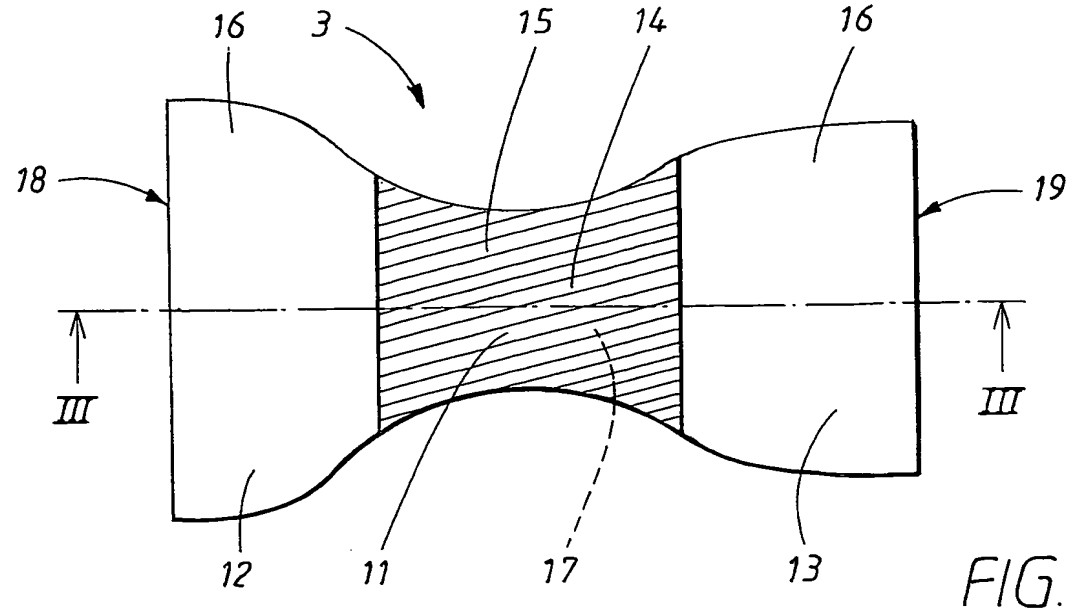

FIG.2

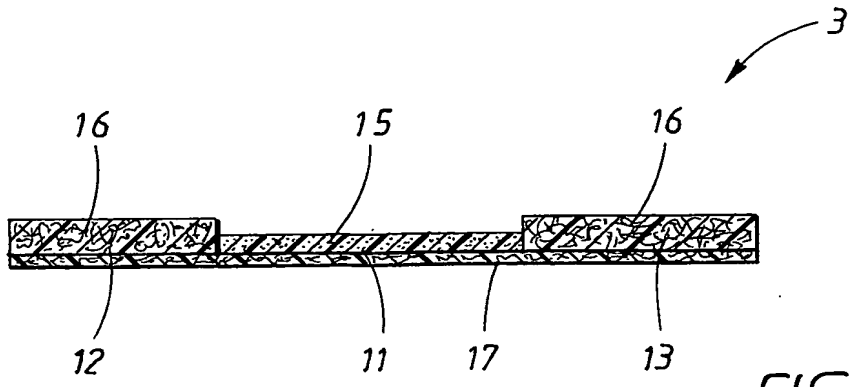

FIG.3

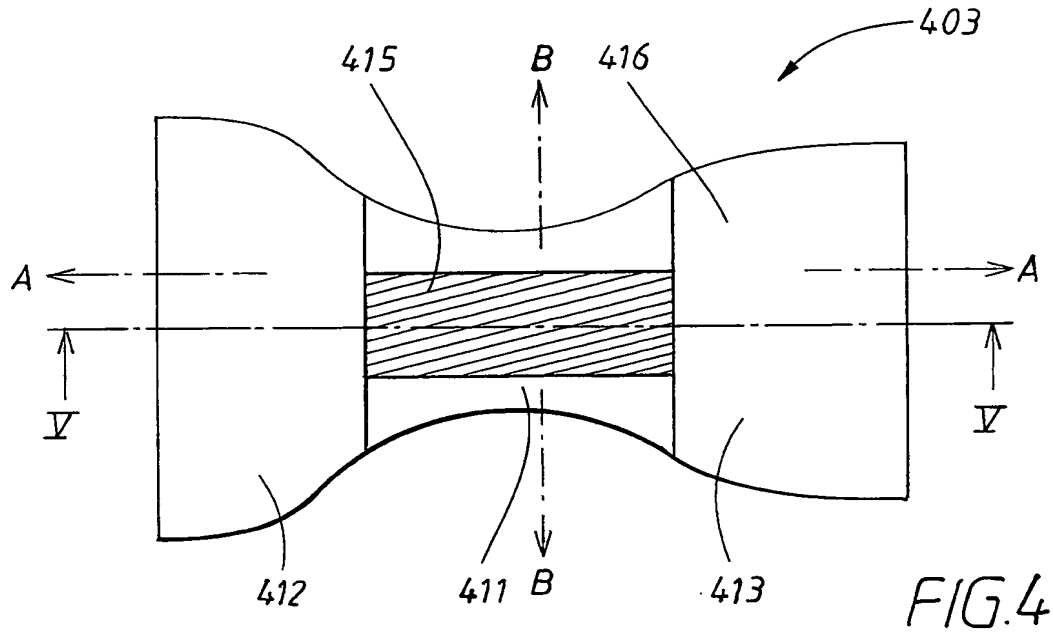

FIG.4

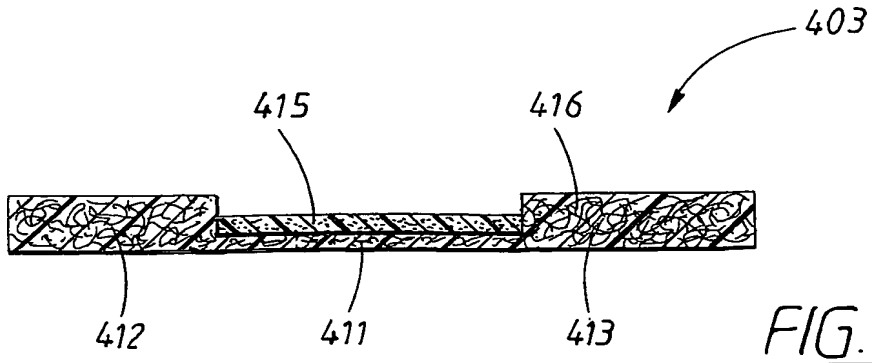

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/02264

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61F 13/535
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0254476 A2 (THE PROCTER & GAMBLE COMPANY), 27 January 1988 (27.01.88), page 3, line 29 - page 4, line 1, figure 3 --	1-10
Y	US 3592194 A (ROBERT C DUNCAN), 13 July 1971 (13.07.71), column 2, line 5 - line 7; column 2, line 74 - column 3, line 9; column 3, line 22 - line 25, column 4, line 74 - column 5, line 21; column 8, line 30 - line 32; figures 3,5, 7; abstract --	1-10
A	EP 0600454 A1 (KIMBERLY-CLARK CORPORATION), 8 June 1994 (08.06.94), page 4, line 36 - line 42 --	1-2

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 March 2003	13-03-2003
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International application No.
PCT/SE 02/02264

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